

REMARKS

Claims 20, 21, and 32 have been amended. Upon entry of this amendment, claims 1-6, 8-12, and 14-45 will be pending in the application.

Allowed and Allowable Subject Matter

Applicants acknowledge allowance of claims 1-6, 8-12, and 14-19.

Applicants further acknowledge the indication of claims 21-31 and 36-45 as allowable. Claim 21 has been rewritten in independent form. Thus, applicants respectfully submit claim 21 and claims 22-25, 30, and 31 that depend directly or indirectly from claim 21 are in condition for allowance.

Rejections Under 35 U.S.C. §102

Claim 20

Reconsideration is respectfully requested of the rejection of claims 20 and 26-29 under 35 U.S.C. §102(b) based on the disclosure in U.S. Patent No. 5,503,286 to Nye, III et al.

Independent claim 20, as amended, is directed to a multilayer solder preform comprising first, second, and third metal preform layers, where the middle (first) layer comprises a solder metal bonding component into which is admixed an additive selected from among thermal conductivity enhancement components, CTE modifying components, and mixtures thereof. Support for the amendment to claim 20 may be found, for example, at page 18, lines 7-10 of applicants' specification.

In contrast, Nye, III et al.'s Fig. 3 as applied by the Office has first layer 90, second layer 80, and third layer 120. On the first layer 90 there is a layer 100 which Nye, III et al. describe as "about 1 KÅ [thick] of Au, for the purpose of protecting Cu surface from oxidizing during storage and handling

prior to depositing solder layer 120." (See, column 4, lines 36-38)

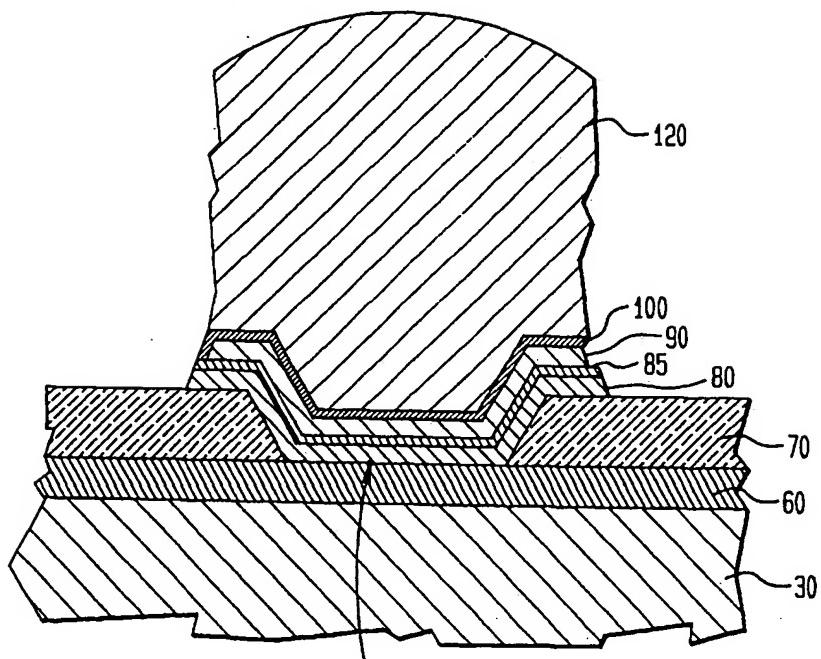


Fig. 3 of Nye, III et al.

Nye, III et al.'s element 100 which the Office corresponded to applicants' "additive" is therefore a surface layer for oxidation protection. Nye, III et al.'s 100-on-90 combination of layers is one on top of the other, not an admixture. Therefore it does not anticipate or suggest the "preform layer ... comprising a solder metal bonding component *into which is admixed* an additive selected from among thermal conductivity enhancement components, CTE modifying components, and mixtures thereof."

Moreover, since Nye, III et al.'s layer 100 is provided as a layer to protect against corrosion - a surface phenomenon, it would not have been obvious to modify it from being a surface layer to being part of an admixture.

Accordingly, applicants respectfully submit that claim 20 is neither anticipated nor rendered obvious by the disclosure of Nye, III et al. Applicants further respectfully submit that claims 26-29 that depend directly or indirectly from claim 20 are likewise patentable over the cited reference for the reasons set forth above concerning claim 20 and in view of the additional limitations incorporated therein.

Claim 32

Reconsideration is also respectfully requested of the rejection of claims 32-35 under 35 U.S.C. §102(e) based on the disclosure in U.S. Patent No. 6,906,417 to Jiang et al.

At page 3 of the Office action, the Examiner points out the changes to 35 U.S.C. §102(e) and that these changes do not affect the determination of prior art dates for U.S. patents resulting directly or indirectly from an international application filed before November 29, 2000. Applicants are unclear as to the effect of this statement on the prior art date of Jiang et al. as applicants' investigation did not identify an international application from which Jiang et al. directly or indirectly issued. In any event, for the reasons set forth below, applicants respectfully submit that claim 32, as amended, is patentable over the disclosure of the Jiang reference.

Claim 32, as amended, is directed to a solder preform comprising a sphere body comprising a solder metal bonding component into which is admixed an additive component selected from among thermal conductivity enhancement components, CTE modifying components, and mixtures thereof. The solder preform of claim 32 further comprises a sphere body surface layer comprising a solder metal over the sphere body. Support for the amendment to claim 32 may be found, for example, at page 20, lines 18-22 of applicants' specification.

Jiang et al.'s Fig. 1 relied on in the Office action shows a structure including solder bumps made up of a core 42 consisting of, for example, copper and an outer layer 44 consisting of, for example, silver. The solder bumps are bonded to a semiconductor die 20 and the surface of another substrate 10 using bonds pads 46.

The Office asserts that outer layer 44 corresponds to applicants' additive of claim 32. However, Jiang et al. describe the outer layer 44 as a coating that allows reflow soldering of a semiconductor device to the substrate without the use of additional solder or solder flux. (See, column 5, lines 23-29)

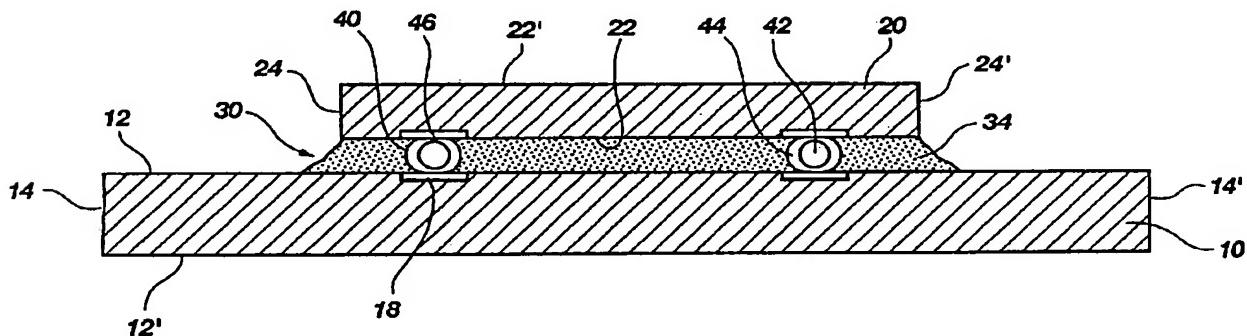


Fig. 1 of Jiang et al.

A core 42 and outer layer 44 shown in Jiang et al.'s Fig. 1 cannot fairly be characterized as an admixture of a solder metal component and an additive. Rather, it is a coated sphere.

The material of the outer layer 44 is selected so that the layer melts before the core 42 in order to compensate for any non-planarity in the surface of the substrate or semiconductor device to be connected and/or any variations in size of the balls of the ball grid array. (See, column, 7, lines 6-12) Such advantages would not be achieved with an admixture of the core 42 and outer layer 44. Thus, it would not have been

obvious to modify the core 42 and outer layer 44 structure of Jiang et al. to provide an admixture as required in claim 32.

Accordingly, Jiang et al. does not anticipate or suggest the solder preform of claim 32 that comprises a sphere body comprising a solder metal bonding component into which is admixed an additive component selected from among thermal conductivity enhancement components, CTE modifying components, and mixtures thereof.

Moreover, applicants further respectfully submit that claims 33-35 that depend from claim 32 are likewise patentable over the cited reference for the reasons set forth above concerning claim 32 and in view of the additional limitations incorporated therein.

CONCLUSION

In view of the above, favorable reconsideration and allowance of all pending claims are respectfully solicited.

Upon entry of this amendment a total of 43 claims (7 of which are independent) will be pending in the application. A * check in payment of the applicable excess claim fee is enclosed.

The Commissioner is requested to charge any fee deficiency or credit any overpayment to Deposit Account No. 19-1345.

Respectfully submitted,



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